

What is Claimed is:

1. In combination with a hydrocarbon production equipment component which in use is submerged in sea water and through which a hydrocarbon fluid is permitted to flow, the improvement comprising a thermal insulation material which

5 comprises:

a silicone matrix; and

a plurality of non-metallic beads which are suspended directly in the matrix;

10 wherein the insulation material is disposed over the component to thermally insulate the hydrocarbon fluid from the sea water.

2. The combination of claim 1, wherein the matrix comprises an addition cured silicone material.

3. The combination of claim 1, wherein the matrix comprises a platinum cured, addition cured silicone material.

15 4. The combination of claim 1, wherein the matrix comprises an RTV silicone rubber.

5. The combination of claim 1, wherein the beads comprise hollow glass beads.

20 6. The combination of claim 5, wherein the beads comprise a mean diameter of less than about 60 microns and an isostatic strength of at least about 10,000 psi.

7. The combination of claim 5, wherein the beads comprise an epoxy silane surface treatment.

8. The combination of claim 1, wherein the insulation material comprises about 50-95% by volume of the matrix and about 5-50% by volume of the beads.

9. The combination of claim 8, wherein the insulation material comprises about 65-95% by volume of the matrix and about 5-35% by volume of the beads.

5 10. The combination of claim 9, wherein the insulation material comprises about 75-85% by volume of the matrix and about 15-25% by volume of the beads.

11. The combination of claim 10, wherein the insulation material comprises about 80% by volume of the matrix and about 20% by volume of the beads.

10 12. The combination of claim 1, wherein the insulation material comprises:
a base layer which includes the matrix and the beads; and
an outer coating which is disposed over the base layer;
wherein the outer coating comprises a hardness greater than that of the base layer.

15 13. The combination of claim 12, wherein the outer coating comprises a density greater than that of the base layer.

14. A method for thermally insulating a hydrocarbon fluid which flows through a production equipment component that in use is submerged in seawater, the method comprising:
providing an insulation material which comprises a silicone matrix and
20 a plurality of non-metallic beads which are suspended directly in the matrix; and
installing the insulation material on at least a portion of the component;
wherein the insulation material will thermally insulate the hydrocarbon fluid from the sea water when the component is submerged in the sea water.

15. The method of claim 14, wherein the installing step comprises:
constructing a mold around the component; and
casting the insulation material between the component and the mold.

5 16. The method of claim 14, wherein the installing step comprises:
pre-casting the insulation material into at least one section which is
shaped to complement the shape of at least a portion of the component; and
fastening the pre-cast section to the component.

17. The method of claim 14, wherein the installing step comprises spraying
the insulation material onto at least a portion of the component.

10 18. The method of claim 14, wherein the matrix comprises an addition
cured silicone material.

19. The method of claim 14, wherein the matrix comprises a platinum
cured, addition cured silicone material.

15 20. The method of claim 14, wherein the matrix comprises an RTV silicone
rubber.

21. The method of claim 14, wherein the beads comprise hollow glass
beads.

22. The method of claim 21, wherein the beads comprise a mean diameter
of less than about 60 microns and an isostatic strength of at least about 10,000 psi.

20 23. The method of claim 21, wherein the beads comprise an epoxy silane
surface treatment.

24. The method of claim 14, wherein the insulation material comprises
about 50-95% by volume of the matrix and about 5-50% by volume of the beads.

25. The method of claim 14, wherein the insulation material comprises about 65-95% by volume of the matrix and about 5-35% by volume of the beads.

26. The method of claim 14, wherein the insulation material comprises about 75-85% by volume of the matrix and about 15-25% by volume of the beads.

5 27. The method of claim 14, wherein the insulation material comprises about 80% by volume of the matrix and about 20% by volume of the beads.

28. The method of claim 14, further comprising installing an outer coating over the insulation material.

29. The method of claim 28, wherein the outer coating comprises a
10 hardness greater than that of the insulation material.

30. The method of claim 28, wherein the outer coating comprises a density greater than that of the base layer.